

Robot Laboratory



Robot Laboratory

FUNCTION: Provides environment for developing and evaluating intelligent software for both actual and simulated autonomous vehicles. Laboratory computers provide environment for testing intelligent algorithms on simulated land, air, and sea vehicles. The laboratory, which includes several types of indoor and outdoor robot platforms, serves as a test bed for robotics applications. The mobile robots are also available as test platforms for sensors, interfaces, and other technologies being developed by groups within NRL.

INSTRUMENTATION: In addition to the robots' autonomous capabilities, communication with stationary host computers is available via two different 2.4 GHz wireless data networks and a 2.4 GHz wireless video system. Sensor data and robot performance are logged in software and are the responsibility of the principal investigator of any project.

DESCRIPTION: The robot laboratory is a 1256-ft² facility that allows freedom of motion for mobile robots and can be configured with obstacles or furniture to simulate a tested robot's expected working environment.

The facility maintains 10 commercial mobile robots from companies with a wide following in the robotics community. This enables the integration of outside research from other government, academic, and industry laboratories. The robots include seven Nomadic Technologies robots of varying design and capability for indoor applications and three RWI all-terrain robot vehicles for mixed indoor and outdoor applications.

Proprioceptive sensors on the robots include odometry, pitch/roll/yaw sensor, compass, inertial position tracker, and tactile bumpers. Onboard range finders include sonar, active infrared, scanning laser LIDAR, structured light, and stereo vision cameras. Computing facilities include many Sun workstations, Windows PCs, Linux PCs, and Macs in both desktop and notebook models.

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LOCATION:

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Fleet Information Systems Security Technology Lab (FISSTL)



Fleet Information Systems Security Technology Lab (FISSTL)

FUNCTION: Provides unique facilities for NRL research into Navy information technology network security. From architectural design, review, and prototyping to component evaluation and integration, the FISSTL ensures secure capability and availability of Navy Network-centric information operations.

INSTRUMENTATION: Senior technical task leaders/principal investigators are responsible for test equipment and system components under development, including protocol analysis tools, vulnerability assessment tools, and network mapping instruments.

DESCRIPTION: The FISSTL has connectivity via the NRL LAN, NIPRNet, and the SIPRNet. Testbed configurations allow concurrent architectural design testing and evaluation of potential COTS/GOTS security components. Other aspects of the lab facilitate the development of Navy/DoD unique security components and systems.

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LOCATION:

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Navy Shipboard Communication System Testbed



Navy Shipboard Communication System Testbed

FUNCTION: Provides resources for initial development and testing of new secure voice technologies for Navy shipboard applications.

INSTRUMENTATION: The core of the laboratory is the shipboard secure voice installation. This equipment consists of a SAS 2112 Red Switch, the associated analog audio distribution system, which includes red phone stations and several racks of tactical radios.

The laboratory also contains a Lucent Definity PBX and several stations of digital telephones. Both the red analog and the digital telephony systems are linked to other Navy installations to provide outside connectivity for more extensive testing.

DESCRIPTION: This laboratory consists of a suite of rooms configured with Navy shipboard communications systems. By replicating the tactical communications installations aboard ships, this facility provides the means to perform interoperability testing of emerging communications technologies. It also contains workspaces for the development of both electronic hardware and the various levels of software (embedded to application level) that typically comprise communications devices.

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LOCATION:

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Virtual Reality (VR) Laboratory



The Virtual Reality Laboratory

FUNCTION: Performs basic and applied research in virtual reality (VR), augmented reality (AR), and interactive 3-D computer graphics. The VR Laboratory is also used to support the visualization of NRL scientific data sets

DESCRIPTION: The VR Laboratory includes an Immersive Room (the GROTTO), two VR Responsive Workbenches, head-mounted displays, a multipiped SGI Onyx Computer that drives the GROTTO display, two additional SGI Onyx computers, several lower-end SGI and PC workstations, wearable computers with see-through displays, magnetic and inertial trackers, and a variety of interactive devices.

The Immersive Room, sometimes known in the VR literature as a "CAVE," is a 10 × 10

× 8-ft room on which stereo images are projected onto four surfaces, allowing users to feel as though they are inside the virtual environment. By using a 3-D joystick and with the aid of magnetic trackers, a user navigates through the virtual scene (e.g., a ship, a battlefield, a scientific data set). The VR Responsive Workbench, an important VR display paradigm of which NRL was a pioneer, provides a semi-immersive stereo overview of a scene. The Workbench has been found to be an excellent tool for battlefield visualization. The suite of AR equipment is being used to develop new technologies for providing visual information to a mobile user that appears directly atop the real world.

CONTACT:

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LOCATION:

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Ship Motion Simulator Facility



Ship Motion Simulator Facility

FUNCTION: Provides a regional facility for conducting research under conditions of simulated shipboard motion. Research areas include the impact of shipboard motion upon engineering systems and sensors and the impact of shipboard motion upon human performance, particularly with respect to the interaction between human operators and sophisticated computer interfaces. This facility provides a cost-effective means for conducting such studies.

DESCRIPTION: NRL has owned and operated a ship motion simulator since 1943. Originally developed to provide gunnery practice for sailors, the ship motion simulator has been used more recently to test radar and satellite receiving systems. Under sponsorship of the Office of Naval Research, an operations van has recently been attached to the reinforced upper deck of the ship motion simulator. The van can accommodate five to six experimenters and subjects. A heating/cooling unit maintains uniform climate control. Shelves, desks, and work areas provide adequate space for computer monitors and support hardware. A permanent intercom system provides continuous communication between the occupants of the van and the ship motion simulator operators. Different motion scenarios can be designed and run as required. Hourly operating costs are low.

CONTACT:

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LOCATION:

Chesapeake Bay Detachment • NRL, Chesapeake Beach, MD

Distributed Collaborative Engineering Environment Laboratory



Distributed Collaborative Engineering Environment Laboratory

FUNCTION: Provides the Advanced Information Technology (AIT) Branch and NRL staff to conduct research in collaborative engineering environment with collaborative enterprise technologies.

DESCRIPTION: The laboratory includes many Pentium workstations, wireless Palm Pilots, and notebook computers running in a wireless network as well as other state-of-the art collaborative tools (e.g., smart white board). Also powered by a high-performance SUN, it supports desktop VTC, remote conferencing and distributed engineering. It provides a test bed for research in human/computer interaction and user interface for collaborative engineering environment. Advanced display systems such as augmented reality (AR) are used for user interface testing. Research in collaborative enterprise technology (which provides an efficient, distributed object computing framework for knowledge collection, distribution, and management) is being conducted.

CONTACT:

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LOCATION:

Bldg. 34, Rm. 109B • NRL, Washington, DC

NEWAVE Research Center



Naval Engagement Warfare Analysis and Virtual Engineering (NEWAVE) Research Center

FUNCTION: Provides the Advanced Information Technology (AIT) Branch and NRL staff the capability to conduct research in virtual engineering, distributed simulation, parallel processing, and collaborative environment technologies.

DESCRIPTION: The NEWAVE facility has been developed as a multiscreen distributed simulation laboratory and viewport. It is powered by SGI workstations and servers, including a 8-CPU Onyx2 InfiniteReality2E with 16 GB Random Access Memory (RAM), 2 graphical pipelines, and hundreds of GB disk space as well as several Pentium Workstations linked to the NRL, HPC Distributed Center with ATM/SONET networking. The facility is capable of handling high-performance computing, graphics, and distributed simulation. It is a multipurpose facility, that can be used as a command center, battlefield visualization, virtual prototyping, flight simulator, collaborative engineering environment, warfare analysis, war-gaming, and many other applications.

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LOCATION:

Bldg. 34, Rm. 124 • NRL, Washington, DC

Motion Imagery Laboratory (MIL)



Motion Imagery Laboratory

FUNCTION: Supports research in leading edge progressive scan imaging, high-definition television (HDTV), the technology needed to process very high-resolution images, and the impact on human perception with various presentation and image capture techniques.

DESCRIPTION: The MIL is a research environment that leverages high-end computational assets and networks in close association with applications that can take advantage of leading edge capabilities in state-of-the-art in motion imagery with progressive scan, HDTV. The MIL is working with imagery requirements in the near-term where 1.5 Gbps data streams are needed to handle the raw output and progressing to 10 Gbps and higher in the near future. The MIL at

NRL includes projection facilities for very high definition immersion with surround screens, extremely high-resolution micromirror projection, progressive scan studio cameras, recording/replay capabilities, and other tools for comprehensive work in this area. The MIL is used to assess innovative techniques in next-generation video teleconferencing. Research efforts are conducted as to the collective issues of large single streams on gigabit networks over very long distances in real time and the visual tools to support next-generation motion imagery capabilities. The MIL provides an environment to assess collaboration in intelligence, digital earth model, test and evaluation, and other DoD needs where very high-resolution imagery would have an impact. The MIL supports work in compression technology, processing, transmission, and other technologies to allow access to high-resolution imagery across the spectrum of users from average users at their desktops to the most demanding scientific and analytic needs.

CONTACT:

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LOCATION:

Bldg. 97, Rm. 172 • NRL, Washington, DC

Distributed Center for High Performance Computing



Distributed Center for High Performance Computing

FUNCTION: As a Distributed Center (DC) in the DoD High Performance Computing Modernization Program (HPCMP), NRL's Center for Computational Science supports leading edge introduction of high performance computing to DoD. The Center makes available a range of shared resources, including massively parallel computer systems and high performance networks to NRL, Navy, and DoD scientific users.

DESCRIPTION: NRL's DC in the HPCMP supports the introduction of a variety of leading-edge technologies in high performance computing (HPC). The HPC work includes the introduction or extension of new architectures such as cache-coherent Non-Uniform Memory Access (cc-NUMA), Cache-only Memory Access (COMA), and Multi-Threaded Architectures (MTA) where the application requires access to global shared

memory and large single images to achieve results. Research on the high-end computational assets and networks results in close association with applications that demand these leading edge capabilities. The Center not only operates and maintains leading edge super computers from Silicon Graphics (SGI) and others but supports the scientific users in porting their code to and using these high-end assets. User support includes both the computing assets at NRL as well as HPCMP assets at 20 other locations across DoD. The Center also has more than 12.5 TB of on-line shared rotating disk and robotic storage systems for fileserving and archiving that currently holds 350 TB of multimedia data and is scalable to over a petabyte (Pbyte). HPC research extends to the high performance networks needed for true distributed computing, including the Defense Research and Engineering Network (DREN) and the Advanced Technology Demonstration network (ATDnet). The networking efforts include transparent and ubiquitous computing, security and work in dense wave division multiplexing (DWDM), and switching in optical networks.

CONTACT:

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LOCATION:

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Scientific Visualization Laboratory (Viz Lab)



Scientific Visualization Laboratory

FUNCTION: The Scientific Visualization Laboratory (Viz Lab) is an information center, a video production unit, and a training center for the latest tools in scientific visualization and visual supercomputing. The Viz Lab provides general support across NRL to assist scientists and engineers in producing visual rendering of their work.

DESCRIPTION: The Viz Lab assists scientists at NRL across a broad range of disciplines in taking computational results of their work and applying a visual dimension for further insight and understanding. NRL researchers have direct or networked access to computational and high-end graphics workstations. The Viz Lab has a comprehensive digital broadcast-video editing suite. Alone or assisted, a researcher can quickly produce a professional quality video, including titles and special effects from a montage of computer generated video, stills, graphs, overheads, or even raw data. A wide range of output formats are supported, including color prints, 35-mm slides, computer animations, videotape, or high-resolution digital video display (DVD). The Viz Lab staff also assists researchers in porting their scientific applications to the Virtual Reality Lab's GROTTA for 3-D, interactive, stereo viewing.

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